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(54) **Device for supporting a web on a bed of air**

(57) Air bars 12 extending lengthwise parallel to one another are mounted on the front of a plenum chamber 10 with their front walls 28 lying substantially on an arc around which a moving web W is guided. Each air bar 12 has a pair of elongate Coanda nozzle outlets 29, extending along the opposite longitudinal edges of its front wall 28, through which pressurised air from the plenum chamber 10 emerges as streams that converge across the front wall 28 and which support the web W without contact between the web W and the front wall 28. Plates 44 extend between the pairs of adjacent air bars and these plates 44 have their front surfaces on an arc concentric with the arc of the front walls 28 but of smaller radius. An air dam 117 at each end of each plate 44 restricts the flow of air from beneath the web W in the lengthwise direction of the plate 44. Further air dams 45, adjacent each edge of the web W, prevent excessive spillout of pressurised air from beneath the web W.

Fig. 2-4
Col. 1 Lines 3-8

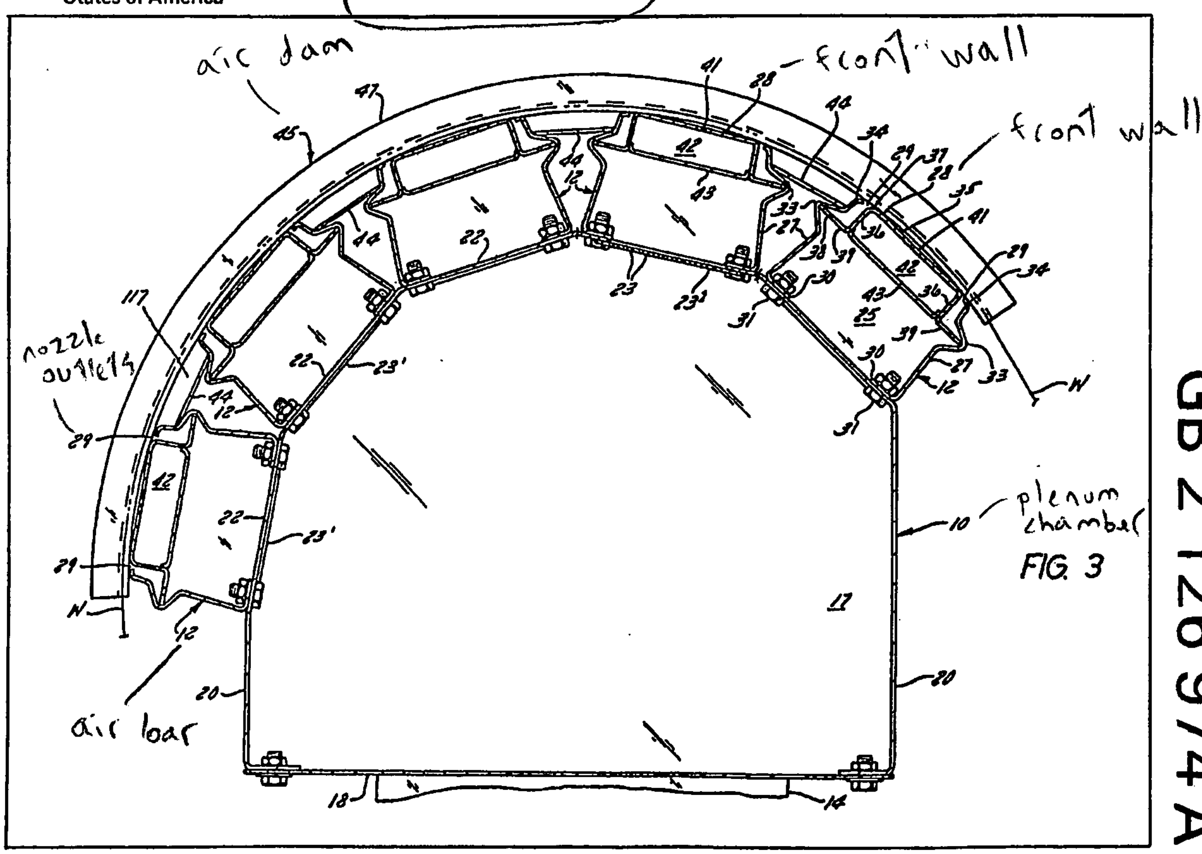

FIG. 3

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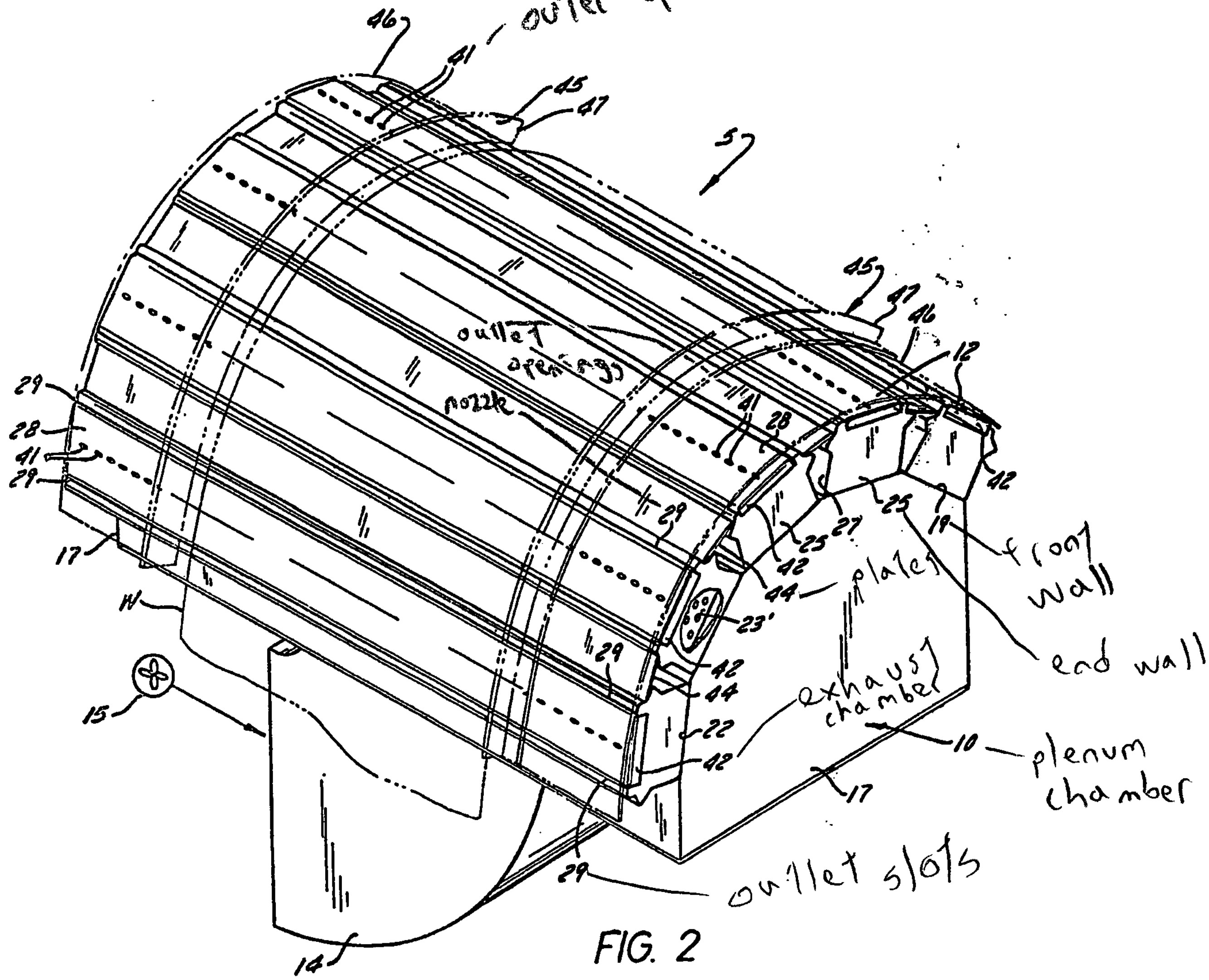
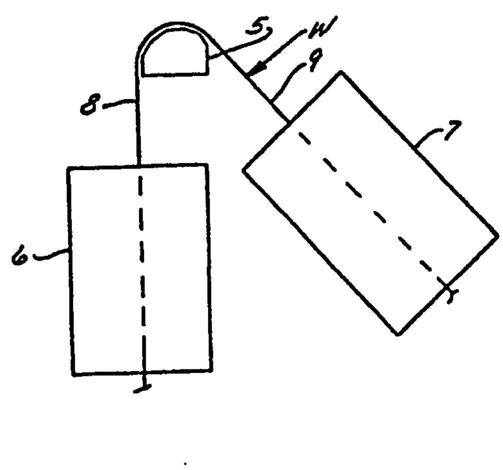


46
41
outer openings
41
45
47
5
45
47
46
12
outlet openings
nozzle
41
28
29
42
25
27
25
19
front wall
end wall
plates
44
23'
42
44
22
exhaust chamber
10
plenum chamber
17
42
29
outlet slots
29
28
41
29
17
W
15
14

FIG. 2



5
W
9
8
7
6

FIG. 1

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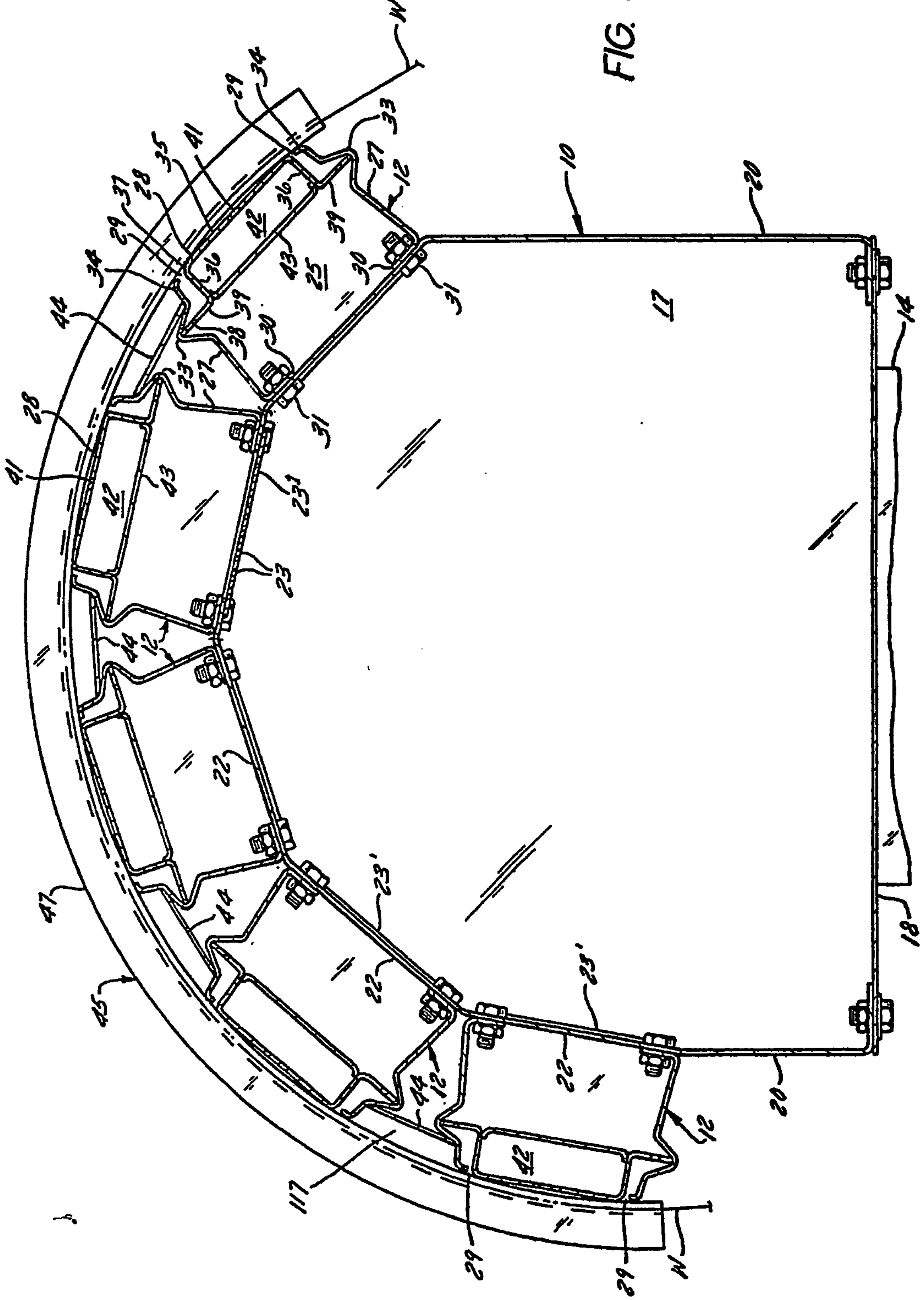

FIG. 3

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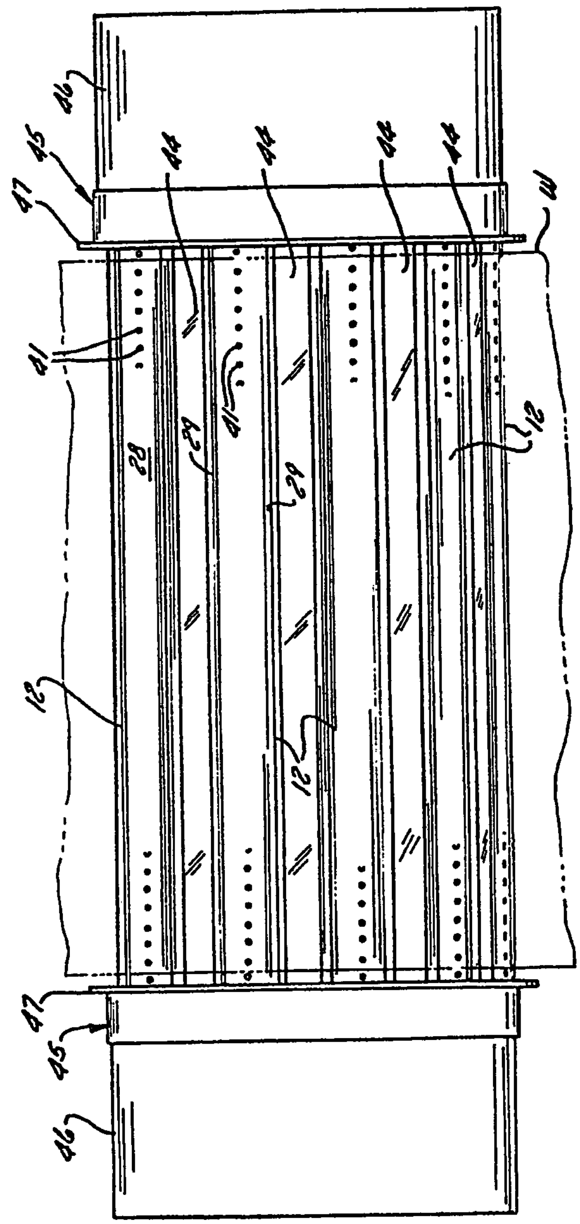

FIG. 4

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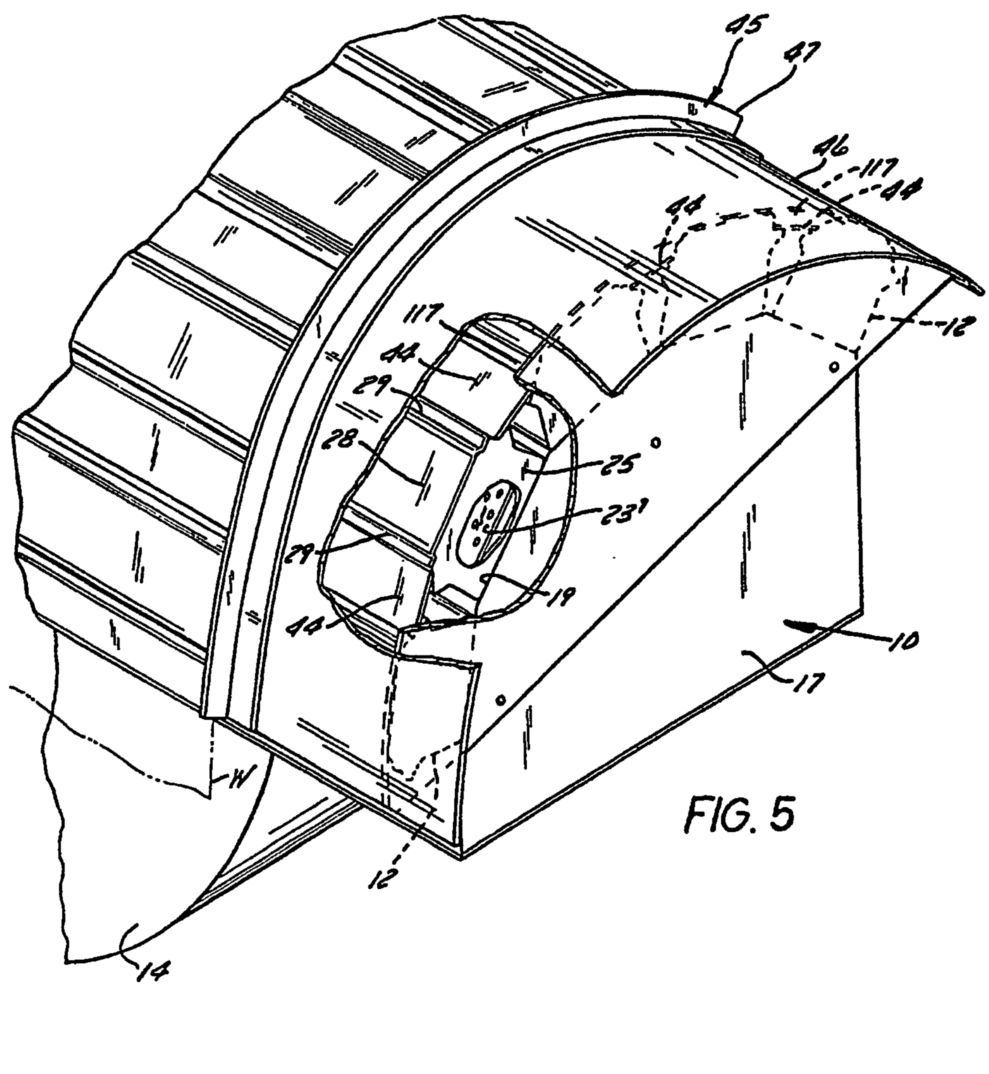

FIG. 5

SPECIFICATION

D vice for supp rting a w b

drying disc,

This invention relates to web supporting apparatus and is more particularly concerned with a web supporting a guiding device for a web drying apparatus whereby a lengthwise moving web is floatingly supported whilst being guided around a turn.

In drying a moving web of paper or the like, it is desirable that the web be contactlessly supported during the drying operation, to avoid damage to the web itself or to an ink or a coating on the web. One common arrangement for contactlessly supporting a web comprises upper and lower sets of air bars extending along a straight substantially horizontal stretch of the web. Air issuing from the lower set of air bars floatingly supports the web, and air issuing from the upper set of air bars steadies the web to maintain it substantially straight and at a substantially constant distance from the air bars of both sets. The air blown from both sets of air bars is usually heated to expedite web drying, and usually the air bar array is inside an enclosure which is maintained at a slightly subatmospheric pressure by an exhaust blower that draws off the vapours emanating from the web.

A drying arrangement that operates upon a straight horizontal stretch of web has the obvious disadvantage of occupying a substantial amount of floor space, and therefore much attention has been given to web drying apparatus in which the stretch of web being dried is supported to have a plurality of stretches that extend more or less vertically. Where the web to be dried can be passed in contact with drying rolls, it is usually trained around a succession of such rolls, arranged to define a markedly sinuous path for it. However a freshly imprinted or freshly coated web of paper or plastics must be contactlessly supported during drying, and for guidance of such a web along a path that occupies minimal floor area the drying apparatus should comprise a plurality of contactless turning guides co-operating to define a desired path for the web. It will be evident that contactless turning guides in a web drying apparatus should preferably accomplish some drying of the web in addition to supporting and guiding it.

U.S. Patent No. 3,279,091 discloses a device for drying a moving web while contactlessly supporting and guiding it around a turn. The device comprises a non-rotating cylindrical shell of less than circular extent having in its outer surface a series of axially extending air outlet slots that are spaced apart circumferentially. From each of these sl ts heated pressure air flows radially outwardly to impinge against the inner surface of a web that is partially wrapped around the shell, t floatingly support the web while drying it. The shell also has rand mly distributed air holes that provide an exhaust path for heated air. Flanges along the edges of the web serv as air dams that prevent substantial escape of pressure air from und r the web except through the exhaust hol s. The outlet nozzle configuration is such as to requir a v ry high air power to ensure c ntactless supp rt of the web, as is apparent from the disclosure that the heated air issues from the outlet slots "in the form of elongated jets having a veloity of from 12,000 to 20,000 fpm (4,000 to 6,000 m/min) and impinges on the bottom surface of the moving web . . .". The apparatus has also be criticised (in U.S. Patent No. 4 218 833) on the ground that "in order to maintain a workable air cushion for the moving web, impossibly fine tension control is required since a balance has to be continuously maintained between the radially outwardly acting forces on the web arising as a result of the tension in the web . . .".

Another form of apparatus for drying a moving web while contactlessly supporting it and guiding it around a turn is disclosed by U.S. Patent No. 4 218 833, wherein a plurality of nozzle pairs are arranged in a part-circular array around which the moving web passes. Each nozzle is a Coanda nozzle that discharges in one circumferential direction, while a closely adjacent nozzle with which it is paired discharges in the opposite circumferential direction, so that the two nozzles of each pair discharge circumferentially divergent air streams. The nozzle pairs alternate around the circumference of the shell with exhaust apertures in the shell surface. Into these exhaust apertures flow the converging streams from circumferentially adjacent nozzle pairs. The surface of the shell defines a continuous arc of uniform radius broken only by the Coanda nozzle pairs and the exhaust apertures. The flow of pressure air circumferentially around the cylindrical shell surface, between that surface and the web, serves to float the web at only a small distance from that surface, in as much as pressure against the inner surface of the web is very small unless the web is very close to the shell surface. As a result the web tends to drag on the shell in some places, particularly near the exhaust inlets, and the apparatus tends to pose problems with respect to web flutter and web wrinkling. Furthermore, because of the small pressure exerted against the web, the device cannot float a web that is under substantial lengthwise tension.

In the past, various contactless turning guides for running webs have been devices that were intended for web guidance without regard to any web drying function and were aimed at minimising the amount of air flow required for adequate contactless support of a web as it moved around a curve. In general, the most satisfactory turning guides were arranged to provide a cushion of pressure air between the web and an arcuate surface of the device and to require a relativ ly small flow of pr ssure air for maintenance of this cushion. In any such turning guide it is of course essential that pressure against the radially inner surface of the web be uniform all acr ss the width of the web — particularly under its edge portions — and all along th arc of the turn. Prior turning guides that were successful with respect

to low air flow and uniform pressure cushion are disclosed in ur earlier U.S. Patent Specificati ns Nos. 4 182 472, 4 197 972 and 4 288 015. Although these turning guides were very satisfactory as web guiding devices, their otherwise desirable ability to operate with low air flow rates made them unsatisfactory for use as web drying devices, in as much as a substantial flow of air in contact with the web is needed to effect the rapid heat transfer necessary for fast web drying.

However, since adequate web drying can often be accomplished in the straight stretches of web between turning guides, this disadvantage was of lesser importance than the relatively high cost of such prior turning guides. As is apparent from the drawings of the three last mentioned patents, the turning guides that they disclose comprised extruded or cast parts. The tooling needed to produce some of those parts had to be specialised for each width and/or radius of turning guide and therefore had to be amortised over the production of relatively few units. Needless to say, the need for a substantially less expensive contactless turning guide was clearly apparent, but how to achieve it was far from obvious.

Thus, there has theretofore been an unfulfilled need for a substantially less expensive device whereby a lengthwise moving web is contactlessly supported and guided around a turn, and whereby a substantial amount of web drying can also be accomplished. To be satisfactory, such a device must meet rather stringent requirements. In so far as it is intended to function as a dryer, it should provide for sufficient flow of heated air in contact with the web to achieve the necessary heat transfer; but it should not require an air flow that is substantially greater than is adequate for drying, in order to avoid waste of power. The device should in any case support the web at a substantial distance outward from its surface, which distance should be at least 0.125 in (3.2 mm) and is preferably about 0.25 in (6.3 mm). If the web normally comes closer to any part of the surface of the device than 0.125 in, the web may at times drag against the device, or other web handling problems may arise. Notwithstanding this rather substantial distance between the web and the surface around which it is guided, the web must move smoothly and without flutter. In particular, there must be no more than insignificant edge flutter through a wide range of web tensions and air supply pressures. Since low cost is an important objective, production of the device should require a minimum of specialised tooling, and desirably a given device should be capable of accommodating webs of a substantial range of widths, to minimise both production and inventory costs.

According to a first aspect of this invention a d vice for floatingly supporting a lengthwise moving web around a turn in its path comprises:

A) a plurality f el ngate air bars, each having

1) opp site side walls, and

2) a front wall that is located between the side walls and has opposite longitudinally extending edge porti ns which are spaced fr m the side walls to co- perat with them in defining a pair of air outlet slots, each extending along the length of the air bar, the edge portions of the front wall being curved widthwise towards the middle of the air bar so that each of the outlet slots comprises a Coanda nozzle for directing pressurised air forwardly from the interior of the air bar and laterally across the front wall towards the other outlet slot;

B) means defining a plenum chamber whereby the air bars are supported in lengthwise parallel relationship to one another, extending across the width of the path, with their front walls lying substantially on a convex arc of one radius that defines the turn, the plenum chamber having its interior communicable with a source of pressurised air and being in communication with the inside of each air bar at its rear; and,

C) air dam plates having surfaces normal to the length of the air bars, located adjacent the ends of the air bars and extending edgewise across the spaces between them to define air dams that restrain flow of pressure air outwards from the spaces in the lengthwise direction of the air bars.

According to a second aspect of this invention a device for floatingly supporting a web that moves lengthwise along a defined path around an arcuate turn by pressurised air acting against the concave back surface of the web, comprises:

A) means defining a plenum chamber communicable with a source of pressurised air;

B) means defining a plurality of elongate substantially flat first front surfaces on the plenum chamber which

1) extend lengthwise parallel to one another across the width of the path,

2) lie substantially on the arc of the turn, and,

3) are spaced laterally from one another at intervals around the arc;

C) means co-operating with each of the first front surfaces to define a pair of elongated outlet slots opening from the interior of the plenum chamber, each comprising a Coanda nozzle extending along opposite longitudinal edges of the surface and arranged to direct convergent streams of pressurised air obliquely forwardly and laterally inwardly across the front surface;

D) means defining a plurality of elongate substantially flat second front surfaces on the device, each having its width extending between an adjacent pair of the first front surfaces, the second surfaces lying substantially on an arc concentric with the arc of the turn but of smaller radius; and,

E) air dam means defining, at each end of each of the second front surfaces an air dam surface which is substantially normal to it and which projects forwards from it, so that air is restrained against fl w away from th second front surfac in a lengthwise direction.

Embodiments of a web supporting and drying d vice in accordanc with this invention will now be d scribed with reference to the accompanying

drawings; in which:—

Figure 1 is a diagrammatic view of a web drying apparatus in which the device can be incorporated;

Figure 2 is a perspective view of a device;

Figure 3 is a vertical section taken on a plane parallel to its end walls of a device;

Figure 4 is a front elevation of the device, drawn to a smaller scale than Figure 3; and,

Figure 5 is a fragmentary perspective view of a modified embodiment.

In a typical application, a dryer device 5 of this invention guides a lengthwise moving web W around a curve that carries it through a substantial change of direction as it comes up from a vertical dryer 6 and then moves down to an inclined dryer 7. The arrangement of the dryers 6 and 7 is intended to accommodate limitations in both horizontal and vertical room dimensions, and the apparatus as a whole can achieve further compactness because the web can undergo a substantial amount of drying at the device 5.

It will be observed that a rather long stretch 8 of unsupported and unguided web extends vertically upwardly from the vertical dryer 6 to the device 5, and a similarly unsupported and unguided stretch 9 extends obliquely downwardly from the device 5 towards the inclined dryer 7. Such an arrangement is feasible with the device 5 because of its tolerance for small variations in the angles at which the web moves towards and from it.

In general, the device 5 comprises a plenum chamber 10 and a plurality of elongated air bars 12 which are mounted lengthwise parallel to one another on the front of the plenum chamber to receive pressure air from it and which have Coanda nozzles 29, described hereinafter, through which the pressure air is discharged. The air bars 12 are arranged laterally adjacent to one another in an arc that substantially defines the turn or curve of the web around the device 5, and the air issuing from their Coanda nozzles 29 provides an air cushion by which the web is floatingly supported around the turn.

Pressure air is fed into the plenum chamber 10, at its rear, through a suitable duct 14 connected with a pressure air source indicated at 15. It will be understood that when web drying is to be effected at the device 5, the pressure air source 15 will ordinarily comprise a heater.

The plenum chamber 10 is defined by imperforate end walls 17, a rear wall 18 that is imperforate except for the inlet to which the pressure air duct 14 connects, and a front wall 19 that can comprise a single piece of sheet metal bent generally into an arc extending from one to the other of the side edges of the rear wall 18, to thus also define side walls 20. More specifically, the front wall 19 is bent to a partial polygonal shape as seen from either end of the plenum chamber, to have a plurality of flat, substantially identical rectangular panels 22 that meet at obtuse angle corners and on each of which an air bar 12 is m unted. Each flat panel 22 ext nds lengthwise betw en the end walls 17 and has a width substantially equal to the width f th air bar mounted thereon. Each pan l 22 has numerous uniformly distributed perforations 23 through which pressure air flows from the interior of the plenum chamber 10 into the interior of its air bar 12. These perforations 23 can be formed directly in the front wall 19, or else each panel of the front wall can have a large aperture across which extends a screen or sheet 23' that defines the perforations. In any event, the passage of the pressure air through the perforations 23 brings about a uniform pressure distribution inside the air bar, and the perforations thus serve as a flow straightener.

Each of the air bars 12 is generally similar to the air bars disclosed in U.S. Patents Nos. 3 964 656 and 4 197 971, to which reference can be made for information about details of construction. Each air bar thus comprises a pair of flat end walls 25, a pair of elongated side walls 27 that are mirror images of one another, and a front wall 28 that co-operates with the side walls 27 to define a pair of slot like air discharge outlets 29, each comprising a Coanda nozzle extending along the full length of the air bar. Where standard air bars are used, the end walls 17 of each air bar will lie flatwise inwardly adjacent the respective plenum chamber end walls 17, which project edgewise beyond its front wall 19 as hereinafter explained; or the side walls 27 and front wall 28 of each air bar can extend all the way to the plenum chamber end walls 17, which would then also serve as the air bar end walls. The front wall 28 of each air bar comprises the central portion of a channel member 35 that has a hat-shaped cross section.

Extending along the rear edge of each air bar side wall 27 is laterally inwardly projecting flange 30 that flatwise overlies the plenum chamber panel 22 on which the air bar is mounted, and said flange 30 is secured to its underlying panel as by means of bolts 31. Each air bar side wall 27 is bent along its length, as at 33, to define an outwardly projecting ridge of V-shaped cross section that is near the front edge of the side wall but spaced therefrom. A small laterally inturned lip 34 that extends all along the front edge of each air bar side wall 27 defines the adjacent Coanda nozzle outlet 29 in co-operation with the hat section channel member 35 that comprises the front wall 28. Each of the lips 34 is rearwardly offset by a small distance from the flat, forwardly facing surface of the air bar front wall 28. To co-operate with the lips 34 in defining the Coanda outlets 29, the hat section channel member 35 has opposite rearwardly projecting legs 36, each join d t the front wall 28 at a rounded c rner 37 and from each of which a flange 38 pr jects lat rally outwardly to be received in the gr ove defined by the V-shaped bend 33 in the adjacent air bar side wall. The out r edge of each flange 38 is spot welded to the adjacent air bar side wall 27 at intervals along its l ngth.

Holes 39 in each flang 38, at cl sely spaced

intervals along it, permit pressure air from the int rior of th air bar to flow through the flange 38, thence through th space between th adjacent leg 36 of the channel member and its adjacent air bar side wall 27, and out through the Coanda nozzle slot 29. The lip 34, in conjunction with the rounded surface 37, has the well known function of causing the air stream issuing from the slot 29 to flow away from the nozzle in an oblique direction, laterally inwardly across the air bar front wall 28 as well as forwardly towards the web. Upon impinging the web, the stream issuing from each nozzle 29 divides, part of it flowing laterally inwardly under the web in converging relation to a stream component from the other air outlet 29 of the air bar, and another part flowing laterally away from the air bar.

In some cases it may be desirable to provide outlet openings 41 in the air bar front wall 28, at regular intervals all along its length and midway between the outlet slots 29, through which the air streams that converge across the front wall 28 can flow into a tubular exhaust chamber 42 in the front portion of the air bar, all as shown in Figure 2 and in accordance with principles explained in U.S. Patent No. 3 873 013. In such cases the exhaust chamber 42 is defined by a plate 43 that bridges the rearwardly extending legs 36 of the channel member in co-operation with those legs and the front wall 28; and the end walls 25 of the air bar have openings through which the tubular exhaust chamber 42 communicates with the atmosphere at both of its ends. The outlet openings 41, their associated exhaust chamber 42 and its venting outlet will of course tend to increase the flow of air in contact with the web, and they may be particularly desirable where the device 5 is relied upon to effect significant web drying. The holes 41 have been found to be unnecessary where the device is intended to function solely or primarily as a turning guide; and where the holes 41 are omitted (as in the embodiment shown in Figure 5) or are not utilised, the plate 43 can be omitted from each air bar or replaced by brace struts, and the end walls 25 of the air bar will completely close its ends.

The flat front walls 28 of the air bars lie substantially on an arc of constant radius that defines the path of the web as it moves around the device 5. The angle between the front walls 28 of adjacent air bars is related to this radius of web curvature, and should of course be uniform from air bar to air bar around the assembly. Successful results have been achieved with web tensions from about 0.5 to 2.0 pounds per linear inch (0.04 to 0.17 kg/mm) when the angle between front walls 28 of adjacent air bars was in the range of ab ut 20° to about 30°, with a web turn radius of about 9 to 12 in (230—360 mm). With th se parameters the web did not contact the device even with changes in the amount of wrap about th device 5 that corresponded (Figure 1) to swinging of the stretches 8 and 9 through angles of up to approximately 10° about the device 5.

Because adjacent air bars are at an angle to one another, there are gaps between them, but these are filled by plates 44, each of which bridges across th space between a pair of adjacent air bars and extends along their full length. Preferably each plate 44 rests on, and is tack-welded to, the ridges (defined by bends 33) on the adjacent side walls 27 of the air bars that it bridges. The several plates 44 are thus disposed substantially on an arc which is of smaller radius than, but concentric with, the arc that substantially contains the front walls 28 of the several air bars.

As mentioned above, a portion of the air stream issuing from each outlet slot 29 turns laterally away from the air bar after impinging the web, and thus flows into the space between the web and a plate 44. Each of the end walls 17 of the plenum chamber has its front edge curved to the arc upon which the front walls 28 of the air bars are substantially located so that the radially outermost portions of the plenum end walls serve as fixed air dams 117 that project forward from the filler plates 44 and restrain air flow lengthwise outwardly along them. For convenience, in manufacture, the air dams 117 can comprise portions of a separate plate 17′ that is secured to each plenum chamber end wall 17, flatwise outwardly overlying it as best seen in Figure 5. Each filler plate 44 thus co-operates with the fixed air dams 117 to maintain an air cushion in the space in front of the plate, so that the web is maintained at a uniform curvature all around the device.

If the gaps between air bars are left open by omission of the filler plates 44, the web tends to have straight, flat stretches between adjacent air bars, and thus tends to drag on the air bars, unless substantially higher air pressure values are used than are needed with the plates 44 installed. Thus the plates 44 may be omitted in cases where a relatively high air flow in contact with the web is desired for web drying and where the need for higher air pressure is acceptable. On the other hand, moving the plates 44 forwardly from the positions shown, so that they are more nearly at the same radius as the front walls 28 of the air bars, tends to reduce the pressure needed to maintain a smooth curvature of the web around the device and correspondingly reduces the rate of flow of air in contact with the web.

To minimise flutter of edge portions of the web, there is an adjustable air dam 45 outwardly adjacent each edge of the web, to restrict air flow edgewise outwardly from behind the web. The two adjustable air dams 45 are shiftable towards and from one another to accommodate webs of different widths. Each adjustable air dam 45 comprises a plate 46 that is curved to an arch such that the plate can closely overlie the front walls 28 of all air bars of th device. Extending along an inner edge of each plate 46, to be adjacent and parall l to an edge of th web, is a radially outwardly projecting flange 47 that constitutes the air dam proper. The flange 47 projects radially outwardly beyond its plate 46 by a distance at least equal to the normal maximum

spacing of the web from the front walls 28 of the air bars, typically about 0.25 in, to 0.75 in (6.3 mm to 19.0 mm). The air dams have be n found to be most effective when each is about 0.25 in to 0.75 in (6.3 mm to 19.0 mm) from its adjacent edge of the web.

The adjustable air dams 45 prevent substantial waste of pressure air when the width of a web being dried is substantially less than the length of the air bars of the device, because the curved plates 46 of their air dams overlie the then-unused end portions of the air bar outlet slots 29, so that the air stream from each such slot will not be substantially more than sufficient to impinge the web all across its width. The curved plate 46 need not make sealing engagement with the unused portions of the air bar outlet slots; if it closely overlies the front walls of the air bars it will throttle outflow from the unused portion of the slot to the point where any waste of pressure air is negligible. It will be observed that each curved plate 46 also co-operates with its adjacent fixed air dam 117 to define a pocket that traps pressure air in the space that is in front of the plate 44 but outward of each edge of the web.

A device 5 of this invention was constructed in accordance with Figure 5, and tests on it have established that it tends to maintain a web at a desirable clearance distance from the front walls 28 of the air bars even under appreciable changes in web tension. This web clearance stability is due to a favourable relationship between clearance distance and the pressure of the air cushion between the web and the front walls 28. Without any change in the pressure air being fed to the air bars, a small decrease in web clearance distance results in a prompt and relatively large increase in air cushion pressure, and a small increase in clearance distance causes an immediate and substantial decrease in cushion pressure. The device tends to maintain a balance between radially outward air cushion force against the web and the radially inward force component of web tension. If web tension increases, upsetting the balance in the direction to decrease the web clearance distance, the resulting prompt and rapid increase in air cushion pressure under the web ensures that the decrease in clearance distance will be small enough to keep the web well away from contact with surfaces on the device 5. This corrective action takes place automatically, without the need for any change in the pressure air supply or any other operating variable. Therefore, the problem of "impossibly fine tension control [which] is required . . ." (U.S. Patent No. 4 218 833) with some prior turning guides is avoided with the device of this invention.

It will be apparent that the device 5 of this invention can be partially enclosed in an exhaust hood or the like (not shown) by which vapour laden air that has passed in contact with the web can be drawn away. It will also be apparent that a web could be completely dried by passing it successively over tw or more of the devices 5 of this inventi n, arranged to carry the web through curves first in one direction and th n in the other. Furthermore, because th device 5 provides adequate supporting f rce against the concave rear surface of the web, streams of drying air can be blown in any suitable manner against the front surface of the web at the turn.

From the foregoing description taken with the accompanying drawings it will be apparent that this invention provides a simple, inexpensive and very efficient web drying device whereby a lengthwise moving web is floatingly supported while being guided around a turn. It can be seen that the device of this invention accommodates webs of different widths, under different lengthwise tensions, and ensures adequate heat transfer for fast drying of a web with a flow of air that is not uneconomically high.

CLAIMS

1. A device for floatingly supporting a lengthwise moving web around a turn in its path, comprising:

A. a plurality of elongate air bars, each having

(1) opposite side walls, and

(2) a front wall that is located between the side walls and has opposite longitudinally extending edge portions which are spaced from the side walls to co-operate with them in defining a pair of air outlet slots, each extending along the length of the air bar, the edge portions of the front wall being curved widthwise towards the middle of the air bar so that each of the outlet slots comprises a Coanda nozzle for directing pressurized air forwardly from the interior of the air bar and laterally across the front wall towards the other outlet slot;

B. means defining a plenum chamber whereby the air bars are supported in lengthwise parallel relationship to one another, extending across the width of the path, with their front walls lying substantially on a convex arc of one radius that defines the turn, the plenum chamber having its interior communicable with a source of pressurized air and being in communication with the inside of each air bar at its rear; and,

C. air dam plates having surfaces normal to the length of the air bars, located adjacent the ends of the air bars and extending edgewise across the spaces between them to define air dams that restrain flow of pressure air outwards from the spaces in the lengthwise direction of the air bars.

2. A device according to claim 1, further comprising:

D. means in the space between each pair of adjacent air bars defining a forwardly facing surface that extends laterally between each pair of adjacent air bars and extends lengthwise between the air dam plates, each said surface lying substantially on a second arc which is substantially concentric with the convex arc and which is of smaller radius.

3. A device according to claim 2, in which

(1) each f the opposite side walls of ach air bar is bent along its length to define a laterally utwardly projecting ridge; and th means

bridging each pair of adjacent air bars comprises a filler plate supported on the ridges n the adjacent air bars.

4. A device for floatingly supporting a web that moves lengthwise along a defined path around an arcuate turn by pressurized air acting against the concave back surface of the web, the device comprising:

A. means defining a plenum chamber communicable with a source of pressurized air;

B. means defining a plurality of elongate substantially flat first front surfaces on the plenum chamber which

(1) extend lengthwise parallel to one another across the width of the path,

(2) lie substantially on the arc of the turn, and

(3) are spaced laterally from one another at intervals around the arc;

C. means co-operating with each of the first front surfaces to define a pair of elongated outlet slots opening from the interior of the plenum chamber, each comprising a Coanda nozzle extending along opposite longitudinal edges of the surface and arranged to direct convergent streams of pressurized air obliquely forwardly and laterally inwardly across the front surface;

D. means defining a plurality of elongate substantially flat second front surfaces on the device, each having its width extending between an adjacent pair of the first front surfaces, the second surfaces lying substantially on an arc concentric with the arc of the turn but of smaller radius; and,

E. air dam means defining, at each end of each of the second front surfaces an air dam surface which is substantially normal to it and which projects forwards from it, so that air is r strained against flow away from the second fr nt surface in a lengthwise direction.

5. A device according to claim 4, further comprising:

F. a pair of adjustable air dams, each comprising

(1) a plate curved along its length substantially on the arc of the turn closely to overlie the first front surfaces, the plate being of a length to extend across all of the outlet slots and being of a width to cover an end portion of each of the outlet slots, and

(2) a flange on an inner edge of the plate, projecting edgewise radially outwards to provide an air dam that restricts flow of pressurized air outwards past an adjacent edge of the web; and,

G. means for releasably securing each of the air dams in positions into which the air dam can be adjusted in directions parallel to the axis of the arc, so that the air dams can be arranged with their flanges outwardly adjacent side edges of a web to be guided.

6. A device according to claim 4 or 5 in which:

(1) each of the first front surfaces and the two adjacent air outlet slots is defined by an air bar; and,

(2) each of the second front surfaces is defined by a plate extending between laterally adjacent air bars.

7. A device constructed substantially as described with reference to the accompanying drawings.

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